

Amendments to the Claims:

This listing of claims will replace all prior versions and listings, of claims in the application:

Claims 1-80 (canceled)

Claim 81 (new) An osteogenic protein comprising one or more polypeptide chains capable of inducing endochondral bone formation when disposed within a matrix and implanted in a mammal, wherein said polypeptide chain is further characterized as having cysteine residues in the same relative positions as the cysteine skeleton sequence:

```

1           10           20           30           40
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCXXXCXXXXX
           50           60           70
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCCXXXXXX
           80           90          100
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCXCX,
```

or a point mutation thereof, wherein said protein or said mutant protein is capable of inducing endochondral bone formation in a mammal, and wherein each X represents any amino acid.

Claim 82 (new) An osteogenic protein comprising one or more polypeptide chains capable of inducing endochondral bone formation when disposed within a matrix and implanted in a mammal, wherein said polypeptide chain is further characterized as having cysteine residues in the same relative positions as the cysteine skeleton sequence:

```

1           10           20           30           40
CXXXXXXXXXXXXXXXXXXXXXXXXXXXXCXXXCXXXXX
           50           60           70           80
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCCXXXXXXXXXXXXX
           90          100
XXXXXXXXXXXXXXXXXXXXCXCX,
```

or a point mutation thereof, wherein said protein or said mutant protein is capable of inducing endochondral bone formation in a mammal, and wherein each X represents any amino acid.

Claim 83 (new) A protein, produced by expression of recombinant DNA in a host cell, comprising one or more polypeptide chains having a conformation competent to induce bone formation when combined with a matrix and implanted in a mammal, said polypeptide chain having at least 96 amino acids and less than about 200 amino acids, and having a molecular weight of approximately 14-16 kDa in an unglycosylated form or a molecular weight of approximately 16-18 kDa in a glycosylated form as determined by polyacrylamide gel electrophoresis under reducing conditions, wherein said polypeptide chain is encoded by a DNA, one strand of which hybridizes selectively to:

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      10           20           30           40           50
GATCCTAATGGGCTGTACGTGGACTTCCAGCGCGACGTGGGCTGGGACGA
  D  P  N  G  L  Y  V  D  F  Q  R  D  V  G  W  D  D

      60           70           80           90          100
CTGGATCATCGCCCCGTCGACTTCGACGCCTACTACTGCTCCGGAGCCT
  W  I  I  A  P  V  D  F  D  A  Y  Y  C  S  G  A

      110          120          130          140          150
GCCAGTTCCCCTCTGCGGATCACTTCAACAGCACCAACCACGCCGTGGTG
  C  Q  F  P  S  A  D  H  F  N  S  T  N  H  A  V  V

      160          170          180          190          200
CAGACCCTGGTGAACAACATGAACCCCGGCAAGGTACCCAAGCCCTGCTG
  Q  T  L  V  N  N  M  N  P  G  K  V  P  K  P  C  C

      210          220          230          240          250
CGTGCCACCGAGCTGTCCGCCATCAGCATGCTGTACCTGGACGAGAATT
  V  P  T  E  L  S  A  I  S  M  L  Y  L  D  E  N

      260          270          280          290          300
CCACCGTGGTGCTGAAGAACTACCAGGAGATGACCGTGGTGGGCTGCGGC
  S  T  V  V  L  K  N  Y  Q  E  M  T  V  V  G  C  G

      310
TGCCGCTAACTGCAG,
  C  R
```

in 5X SSPE, 10X Denhardt's mix, 0.5% SDS at 50°C, and further wherein said polypeptide chain is further characterized as having cysteine residues in the same relative positions as the cysteine skeleton sequence:

```

      1      10      20      30      40
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCXXXCXXXXX
              50      60      70
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCCXXXXXX
              80      90     100
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCXCX,

```

or a point mutation thereof, wherein said protein or said mutant protein is capable of inducing endochondral bone formation in a mammal, and wherein each said X is an amino acid.

Claim 84 (new) The protein of claim 83, wherein said polypeptide chain is further characterized as having cysteine residues in the same relative positions as the cysteine skeleton sequence:

```

      1      10      20      30      40
CXXXXXXXXXXXXXXXXXXXXXXXXXXXXCXXXCXXXXX
              50      60      70      80
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCCXXXXXXXXXXXXX
              90     100
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCXCX,

```

or a point mutation thereof, wherein said protein or said mutant protein is capable of inducing endochondral bone formation in a mammal, and wherein each said X is an amino acid.

Claim 85 (new) The osteogenic protein of any one of claims 81-84, wherein said protein is a dimeric protein.

Claim 86 (new) The osteogenic protein of any one of claims 81-84, wherein said protein is glycosylated.

Claim 87 (new) The osteogenic protein of any one of claims 81-84, wherein said protein is unglycosylated.

Claim 88 (new) A device for implantation in a mammal, comprising:

a biocompatible, in vivo biodegradable matrix defining pores of a dimension sufficient to permit influx, proliferation and differentiation of migratory progenitor cells from the body of said mammal; and

a substantially pure osteogenic protein comprising one or more polypeptide chains capable of inducing endochondral bone formation when disposed within a matrix and implanted in a mammal, wherein said polypeptide chain is further characterized as having cysteine residues in the same relative positions as the cysteine skeleton sequence:

```
      1      10      20      30      40
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCXXXCXXXXX
              50      60      70
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCCXXXXXX
              80      90     100
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCXCX,
```

or a point mutation thereof, wherein said protein or said mutant protein is capable of inducing endochondral bone formation in a mammal, and wherein each X represents any amino acid.

Claim 89 (new) A device for implantation in a mammal, comprising:

a biocompatible, in vivo biodegradable matrix defining pores of a dimension sufficient to permit influx, proliferation and differentiation of migratory progenitor cells from the body of said mammal; and

a substantially pure osteogenic protein comprising one or more polypeptide chains capable of inducing endochondral bone formation when disposed within a matrix and implanted in a mammal, wherein said polypeptide chain is further characterized as having cysteine residues in the same relative positions as the cysteine skeleton sequence:

```
      1      10      20      30      40
CXXXXXXXXXXXXXXXXXXXXXXXXXXXXCXXXCXXXXX
              50      60      70      80
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCCXXXXXXXXXXXX
              90     100
XXXXXXXXXXXXXXXXXXXXCXCX,
```

or a point mutation thereof, wherein said protein or said mutant protein is capable of inducing endochondral bone formation in a mammal, and wherein each X represents any amino acid.

Claim 90 (new) A device for implantation in a mammal, comprising:

a biocompatible, in vivo biodegradable matrix defining pores of a dimension sufficient to permit influx, proliferation and differentiation of migratory progenitor cells from the body of said mammal; and

a substantially pure protein, produced by expression of recombinant DNA in a host cell, comprising one or more polypeptide chains having a conformation competent to induce bone formation when combined with a matrix and implanted in a mammal, said polypeptide chain having at least 96 amino acids and less than about 200 amino acids, and having a molecular weight of approximately 14-16 kDa in an unglycosylated form or a molecular weight of approximately 16-18 kDa in a glycosylated form as determined by polyacrylamide gel electrophoresis under reducing conditions, wherein said polypeptide chain is encoded by a DNA, one strand of which hybridizes selectively to:

```

      10           20           30           40           50
GATCCTAATGGGCTGTACGTGGACTTCCAGCGCGACGTGGGCTGGGACGA
  D  P  N  G  L  Y  V  D  F  Q  R  D  V  G  W  D  D

      60           70           80           90          100
CTGGATCATCGCCCCGTCGACTTCGACGCCTACTACTGCTCCGGAGCCT
  W  I  I  A  P  V  D  F  D  A  Y  Y  C  S  G  A

     110          120          130          140          150
GCCAGTTCCCCTCTGCGGATCACTTCAACAGCACCAACCACGCCGTGGTG
  C  Q  F  P  S  A  D  H  F  N  S  T  N  H  A  V  V

     160          170          180          190          200
CAGACCCTGGTGAACAACATGAACCCCGGCAAGGTACCCAAGCCCTGCTG
  Q  T  L  V  N  N  M  N  P  G  K  V  P  K  P  C  C

     210          220          230          240          250
CGTGCCACCGAGCTGTCCGCCATCAGCATGCTGTACCTGGACGAGAATT
  V  P  T  E  L  S  A  I  S  M  L  Y  L  D  E  N

     260          270          280          290          300
CCACCGTGCTGCTGAAGAACTACCAGGAGATGACCGTGGTGGGCTGCGGC
  S  T  V  V  L  K  N  Y  Q  E  M  T  V  V  G  C  G

```

TGCCGCTAACTGCAG,
C R

in 5X SSPE, 10X Denhardt's mix, 0.5% SDS at 50°C, and further wherein
said polypeptide chain is further characterized as having cysteine residues in the same relative
positions as the cysteine skeleton sequence:

```

1      10      20      30      40
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCXXXCXXXXXX
      50      60      70
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCCXXXXXXXXXX
      80      90     100
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCXCX,
```

or a point mutation thereof, wherein said protein or said mutant protein is capable of inducing
endochondral bone formation in a mammal, and wherein each said X is an amino acid.

Claim 91 (new) The device of claim 90, wherein said polypeptide chain is further
characterized as having cysteine residues in the same relative positions as the cysteine skeleton
sequence:

```

1      10      20      30      40
CXXXXXXXXXXXXXXXXXXXXXXXXXXXXCXXXCXXXXXX
      50      60      70      80
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCCXXXXXXXXXXXXX
      90     100
XXXXXXXXXXXXXXXXXXXXXXXXXXXXCXCX,
```

or a point mutation thereof, wherein said protein or said mutant protein is capable of inducing
endochondral bone formation in a mammal, and wherein each said X is an amino acid.

Claim 92 (new) The device of any one of claims 88-91, wherein said matrix comprises
collagen and at least one material selected from the group consisting of polymers comprising
lactic acid monomer units, polymers comprising glycolic acid monomer units, bone,
hydroxyapatite, calcium phosphate, muscle, and tissue.

Claim 93 (new) The device of any one of claims 88-92, wherein said protein is a dimeric protein.

Claim 94 (new) The device of any one of claims 88-92, wherein said polypeptide is glycosylated.

Claim 95 (new) The device of any one of claims 88-92, wherein said polypeptide is unglycosylated.

Claim 96 (new) A method of inducing endochondral bone formation in a mammal comprising the step of implanting the device of any one of claims 88-95 in said mammal at a locus accessible to migratory progenitor cells of said mammal.

Claim 97 (new) A method of inducing cartilage formation in a mammal comprising the step of implanting the device of any one of claims 88-95 in said mammal at a locus accessible to migratory progenitor cells of said mammal.